

Remarks

The present application has claims 1, 2, 4-6, 8 and 11-23 pending. Claims 11-19 have been withdrawn from consideration in the present application, but not yet canceled. Applicants have herein amended claim 1, canceled claim 6, and added new claim 24. Accordingly, claims 1, 2, 4, 5, 8, and 20-24 are now under examination in the present application.

Support for the amendment of claim 1 may be found in the specification and the originally-filed claims, particularly in the specification on page 6, line 24, to page 7, line 1. New claim 24 is supported by the specification and the originally-filed claims, particularly by originally-filed claim 3.

In the October 27, 2009 Office Action, the Examiner rejected the pending claims under 35 USC §103 as obvious over Zuber, et al. (USP 6,156,449) in view of Yano (USP 5,380,806) and Tsai, et al. (USP 6,514,296) and Yoshino, et al. (US Pub. No. 2002/0048654 A1).

Applicants respectfully disagree with the Examiner's position.

In the present invention, an improved process for coating various substrates using water-based catalyst inks is provided (see, for example, page 5, lines 1-7). This inventive process overcomes the drawbacks of prior art processes -- including, for instance, short screen life of ink, rapid evaporation of water, unstable ink viscosity, rapid ink drying, clogging of screen, low print quality, weak adhesion; etc. (see the specification, particularly page 4, lines 4-11).

The invention overcomes these drawbacks, in part, by controlling the humidity and temperature of the atmosphere under which the coating and leveling processes occur. This, among other things, prevents the fast evaporation of water - the main ink solvent. As a result, the viscosity of the ink remains constant (since no loss of water occurs) and the ink deposits remain fluid for longer periods of time (since the ink viscosity does not increase).

This latter aspect – fluidity of the ink deposits – allows more time for the leveling process - a surprising and unexpected result – which was found to be essential for obtaining very smooth catalyst layers (see page 5, line 6-7) with very low surface roughness (page 7, line 1-2) and for producing superior MEAs with very good performance (see example 1 and example 2, for instance).

As set forth in claim 1, the presently claimed invention requires the controlling of humidity and temperature in the coating and leveling compartments. This aspect of the invention is neither disclosed nor suggested by the prior art.

As admitted by the Examiner, the Zuber reference fails to teach the leveling of the deposited catalyst. In fact, Zuber is silent to any leveling of the ink. Thus, Zuber cannot teach or disclose the controlling of humidity and temperature during the leveling process as required by the claims. Furthermore, Zuber does not disclose or teach the controlling of humidity and temperature during the coating process either.

The Zuber reference is silent with respect to (1) the coating conditions, (2) the leveling step, (3) the leveling conditions, (4) the leveling period and (5) the fact that coating and leveling occurs in different compartments. All these elements are set forth in claim 1 and none are disclosed or taught by Zuber.

With respect to the missing leveling step, the Examiner relies on the Yano reference. Yano, however, as stated in our previous responses, does not disclose a leveling step, but rather merely the use of a leveling agent in a totally different process.

In the explanation on page 14 of the October 27th Office Action, the Examiner asserts that Yano discloses an ink composition having a leveling agent and when this agent is less than about 0.1 part by weight:

“a rough surface of the coating film attributed to the remainder of the foam generated at the time of the printing and the screen mesh is not sufficiently leveled, and pinholes are likely to be formed on the surface after drying and curing, so that the film tends to have a nonuniform thickness” (Yano, Col. 6, lines 25-45)

Based on this teaching of Yano, the Examiner asserts that it would have been obvious to incorporate the leveling procedure of Yano into the process of Zuber and come up with the present invention. Applicants cannot disagree more.

The leveling process of Yano always takes place during a screen printing operation and is intrinsic to that operation. When an ink is forced through a screen by a squeegee, the ink generally deposits level and form a continuous film. This leveling is intrinsic to this process and depends on viscosity of the ink and happens within seconds after printing.

In contrast, in the present application, an additional leveling process occurs under controlled humidity and temperature and for a period of 1-10 minutes (see claim 1). As discussed above, under the conditions required by the present invention, the ink viscosity does not increase, because the water in the ink deposits does not readily evaporate.

None of these claim elements are taught by Yano or by any combination of Zuber and Yano. Combining Zuber and Yano in the manner suggested by the Examiner only results in the addition of a leveling agent to the Zuber ink composition. There is still no teaching of controlling the humidity and temperature during the leveling process. Nor is there any teaching or suggestion to hinder the evaporation of water from the ink deposits in order to prevent an increase in viscosity.

Furthermore, the ink of Yano is not analogous to the ink of the present invention. Yano discloses an unpigmented ink for use as cover lacquer for printed circuit boards. This ink comprises a polyurethane and an epoxy component (see the title of Yano). The ink of Yano does not contain any water, and thus, is not water-based. To the contrary, the Yano composition is very sensitive to humidity and has to be prepared under a nitrogen atmosphere (see section "Examples", column 8, lines 30-46, of Yano).

Moreover, Yano leads the skilled person away from the process of the present invention. There is no hint to a leveling process in Yano. To the contrary, in col. 7, lines 55-58, Yano states:

"In addition, only the operations of printing and hot drying are needed, and thus expensive machine such as roll press is unnecessary" (emphasis added)

In addition, the Examiner relies on the Tsai reference as teaching the importance of constant humidity and temperature in order to obtain an even coating. The Examiner's reliance is misplaced. Tsai is directed to the manufacture of double-layer bipolar capacitors (see the field of invention). Tsai discloses a printing process for a two-component epoxy material having a useful life of about 30 minutes (see column 29, lines 44-53). Tsai does not disclose any catalyst inks, nor would one skilled in the industry even look to Tsai in attempting to address the shortcomings of Zuber.

Moreover, the wording "normally constant temperature and humidity are important to obtain an even coat" in Tsai refers to the epoxy printing process. This is because the epoxy starts curing at a specific temperature and has a short working time (see col. 20, lines 1-6, of Tsai). This wording has no bearing on the present invention and provides no guidance to one addressing the shortcomings of Zuber.

The claims of the present application do not call for constant temperature or humidity. Nor would constant temperature and humidity necessarily prevent the evaporation of water or prevent the increase in viscosity of the ink deposits during the leveling process as the present invention does. The Tsai reference fails to disclose the actual limitations of the claimed invention – that is, coating a substrate with a water-based catalyst ink or leveling the deposited ink under conditions wherein the humidity is maintained at 60 to 100 % relative humidity and the temperature is in the range of 10 to 60°C.

The Yoshino reference was cited in connection with the surfactant limitation formerly present in claim 1 (now dependent claim 24). The Yoshino reference does not teach or disclose the present limitations of now pending claim 1.

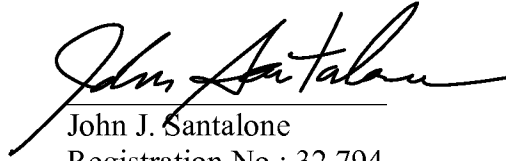
In summary, none of the cited references, either alone or in combination, disclose, teach or suggest the claimed invention. In view of the foregoing remarks and amendments, reconsideration and withdrawal of the rejection under 35 USC §103 and allowance of the application are respectfully requested.

No fee is deemed due with respect to the filing of the present response, other than the fee for the requested three month extension of time and the fee for the accompanying RCE, which Applicants are concurrently filing with the present response. If any additional fees are due, or an overpayment has been made, please charge, or credit, our Deposit Account No. 11-0171 for such sum.

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If the Examiner has any questions regarding the present application, the Examiner is cordially invited to contact Applicants' attorney at the telephone number provided below.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "John J. Santalone", written over a horizontal line.

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